

INDIANA UTILITY REGULATORY COMMISSION

ELECTRIC UTILITY RELIABILITY REPORT 2018

Each investor-owned electric utility (IOU) in Indiana is required to file a reliability report annually with the Indiana Utility Regulatory Commission (IURC) in compliance with 170 IAC 4-1-23(e).ⁱ This document serves as a compilation of the reports filed for 2018 and provides data beginning in 2002 with emphasis on the last 5 and 10 years. This Report includes a graph for each IOU to illustrate the trends in these reliability metrics through 2018.

The utilities provide the following three reliability indices in their annual reports to the IURC.

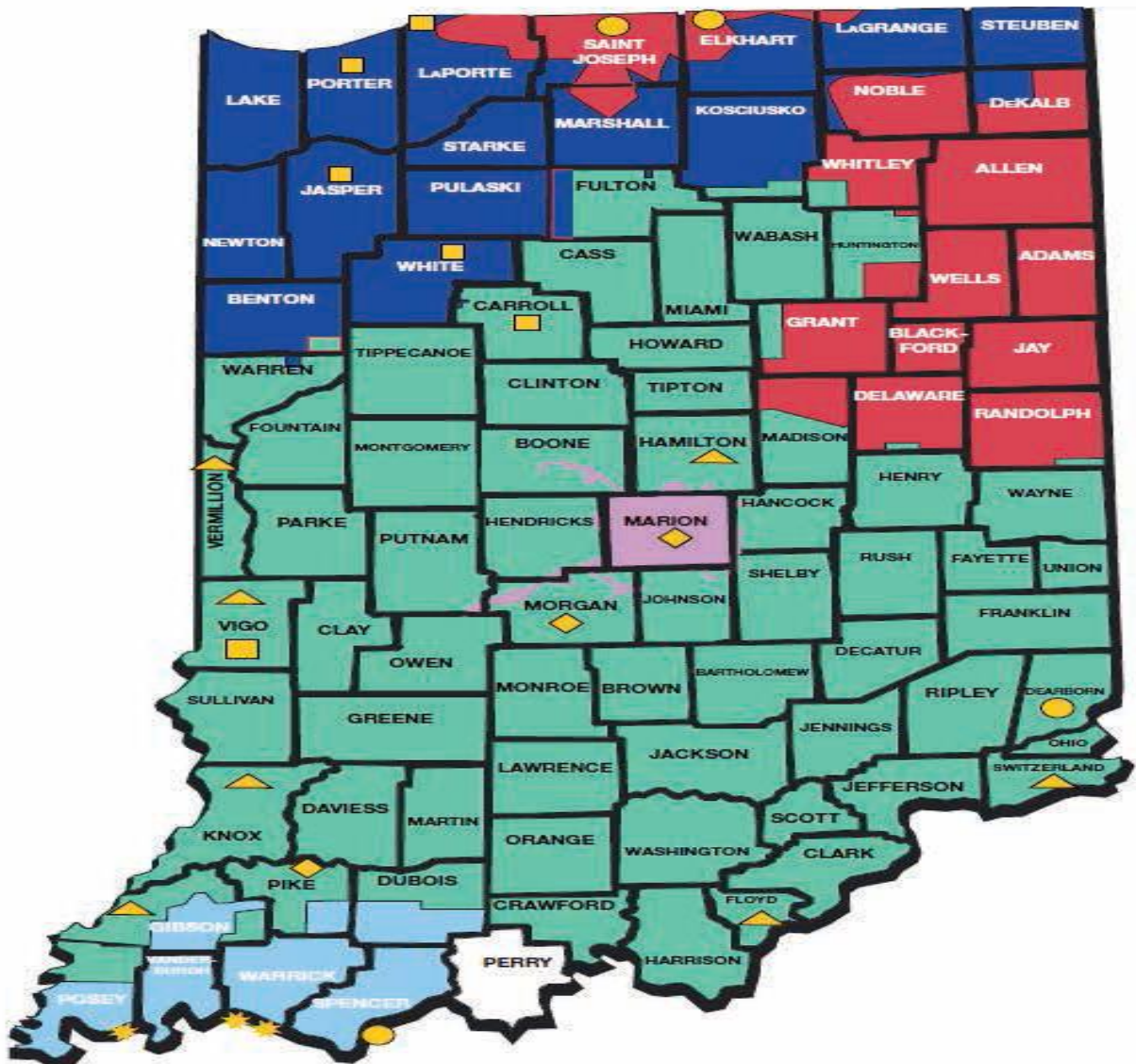
- System Average Interruption Frequency Index (SAIFI): This is the average number of interruptions per customer. It is calculated by dividing the total number of customer interruptions by the total number of customers.
- System Average Interruption Duration Index (SAIDI): SAIDI is the average minutes of interruption per customer. It is calculated by dividing the sum of all customer interruption durations (in minutes) by the total number of customers.
- Customer Average Interruption Duration Index (CAIDI): CAIDI is the average duration of interruptions or the time to restore service to interrupted customers. It is calculated by dividing SAIDI by SAIFI.

Each utility reports its reliability indices with and without major events (Major Event Days or MEDs). Major events are primarily storms or weather events that are more destructive than normal storm patterns. However, major events may also include ice storms, earth quakes, floods, fires, high winds / tornados, and other disasters. Historically, it is important to note that the same definition of “major event” has not been used by all electric utilities which makes comparisons with some other utilities more difficult. In this Report, it is not clear that each utility was using the exact same version of the Institute of Electrical and Electronics Engineers IEEE Standard 1366. This IEEE standard involves the calculation of a threshold of SAIDI minutes based on data from the previous five years. Any day the threshold is exceeded constitutes a MED. The provision of indices that exclude major events normalizes the data by eliminating interruptions over which the utility has little or no control. In addition, there can be considerable variation in a wide range of major events that result in significant damage and require time to make needed repairs. The following table summarizes the number of MEDs for each Investor-Owned Utility in Indiana during 2018.

<u>UTILITY COMPANY</u>	<u>MAJOR EVENT DAYS</u>	<u>MAJOR EVENTS</u>
Duke Energy Indiana	7	7
Indiana Michigan Power	6	6
Indianapolis Power & Light	5	5
Northern Indiana Public Service	10	5
Vectren / Centerpoint	5	5

Reliability metrics, used appropriately, provide useful information on each utility's distribution system, especially if the metrics are considered over several years to lessen the potential that a short series of information may be atypical. Comparisons among utilities should be carefully done since they all have different circumstances (e.g., some serve areas that are more densely populated, some have larger customers, weather differences, age of infrastructure). In addition to the causes of outages that were mentioned previously and are beyond the control of electric utilities, the solutions for improving future reliability are likely to be different for each utility. It is also important to note that perfect reliability is not attainable and efforts to improve these metrics are often expensive.

ELECTRIC SERVICE TERRITORIES OF INVESTOR-OWNED UTILITIES

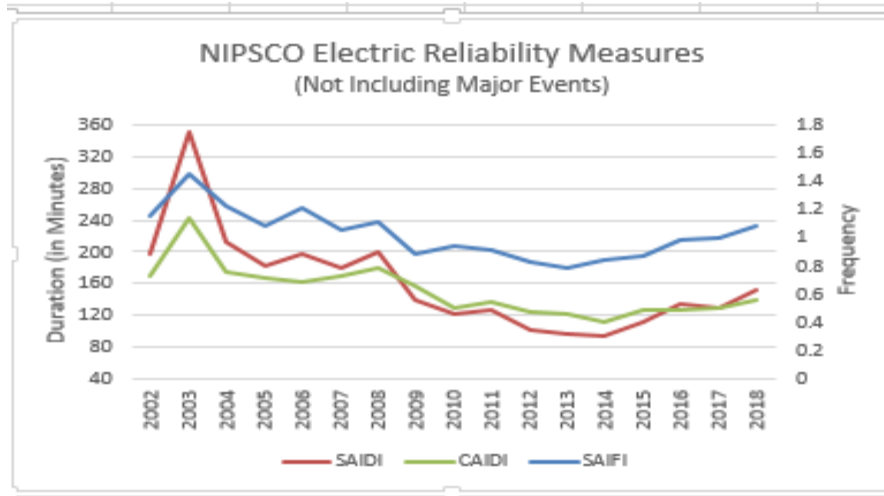


IURC's 2017 Annual Report: This graphic does not include areas served by municipal or rural electric cooperative utilities. Page 24

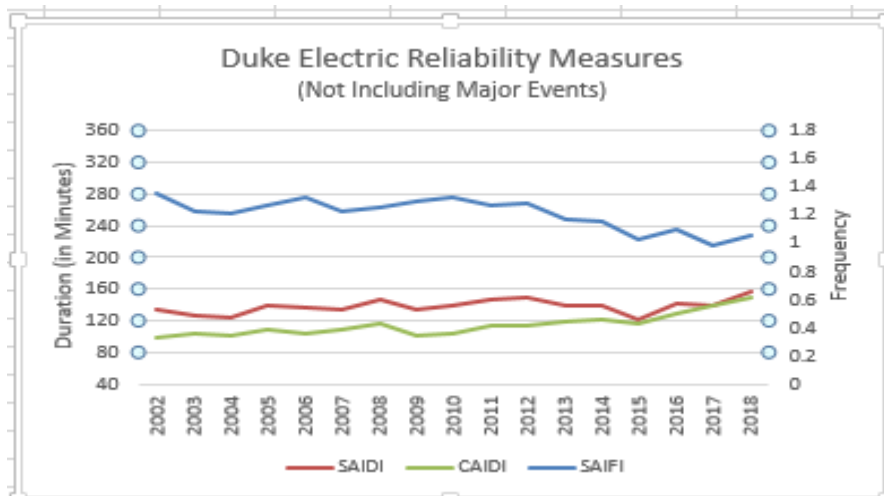
- I&M
- Duke Energy
- IPL
- Nipsco
- Vectren

RELIABILITY REPORTS FOR EACH INDIANA INVESTOR-OWNED ELECTRIC UTILITY

WITHOUT INCLUDING MAJOR EVENTS

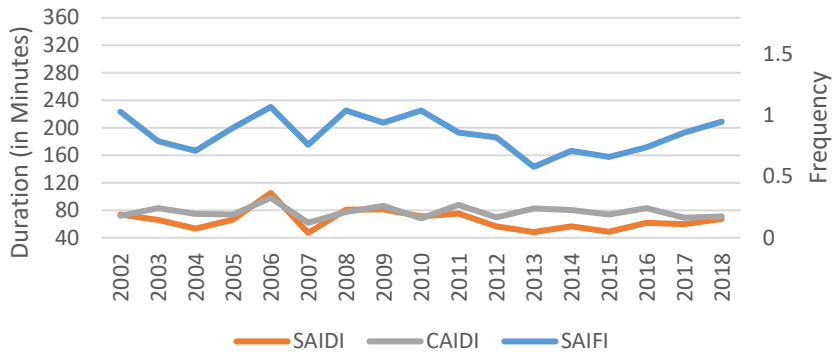


		Electric Reliability Not Including Major Events*																						
NIPSCO		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018						
	SAIFI	1.15	1.45	1.22	1.09	1.21	1.06	1.11	0.88	0.94	0.92	0.83	0.78	0.84	0.87	0.99	1.00	1.09						
	SAIDI	196.2	350.4	213	181	196	180	199	140	122	126	102	95	94	110	135	130	151						
	CAIDI	170.6	241.7	175	166	163	169	179	158	130	137	123	122	111	127	127	129	139						



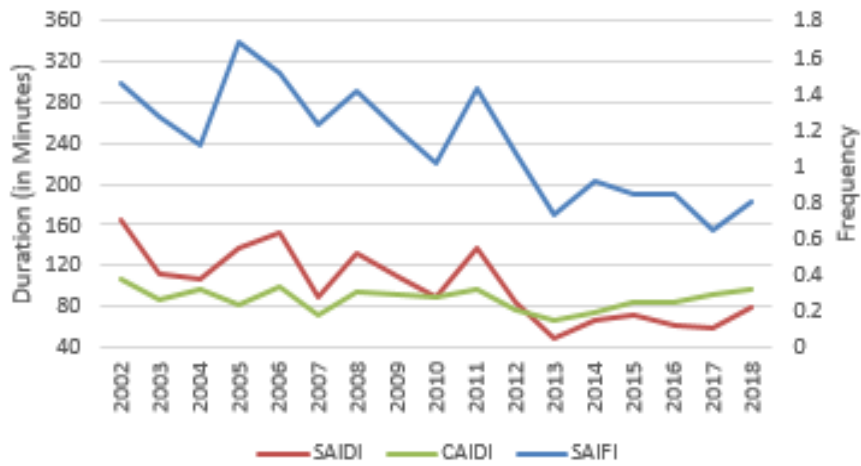
Electric Reliability Not Including Major Events*																		
Duke	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
	SAIFI	1.36	1.22	1.21	1.27	1.32	1.23	1.26	1.3	1.32	1.27	1.29	1.17	1.16	1.03	1.1	0.99	1.06
	SAIDI	134	127	124	138	136	133	146	133	138	146	149	138	140	121	142.49	138	156
	CAIDI	98	103	102	109	103	109	116	102	104	115	115	118	121	117.5	129.6	140	148

IPL Electric Reliability Measures (Not Including Major Events)



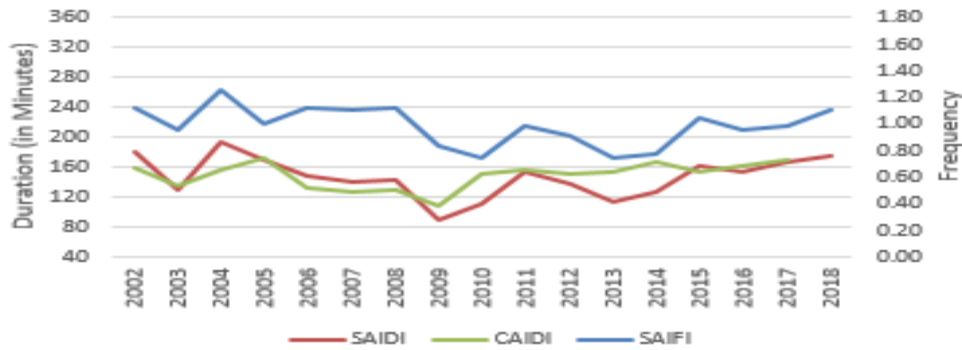
		Electric Reliability Not Including Major Events*																
IPL		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	SAIFI	1.03	0.79	0.71	0.9	1.07	0.76	1.04	0.94	1.04	0.86	0.82	0.58	0.71	0.66	0.74	0.86	0.95
	SAIDI	74	66	53	67	105	47	81	81	71	75	57	48	57	49	62	60	67
	CAIDI	72	83	75	74	98	62	78	86	68	88	70	83	80	74	83	69	71

Vectren Electric Reliability Measures (Not Including Major Events)



		Electric Reliability Not Including Major Events*																
Vectren		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	SAIFI	1.46	1.27	1.12	1.68	1.51	1.23	1.42	1.2	1.02	1.43	1.07	0.73	0.92	0.85	0.85	0.64	0.80
	SAIDI	164	111	107	137	151	89	133	110	90	137	83	48	67	71	62	59	78
	CAIDI	107	87	95	82	100	72	94	92	88	96	78	65	73	83	83	92	98

I&M Electric Reliability Measures (Not Including Major Events)



Electric Reliability Not Including Major Events*																	
I&M	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.12	0.95	1.25	1.00	1.12	1.11	1.12	0.83	0.74	0.99	0.91	0.74	0.77	1.05	0.95	0.98	1.10
SAIDI	179	129	194	171	147	139	144	90	111	154	137	114	128	160	153	166	176
CAIDI	159	135	156	171	131	126	129	109	151	156	151	154	165	153	161	170	160

Electric Reliability Not Including Major Events*																	
NIPSCO	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.15	1.45	1.22	1.09	1.21	1.06	1.11	0.88	0.94	0.92	0.83	0.78	0.84	0.87	0.99	1	1.087
SAIDI	196.2	350.4	213	181	196	180	199	140	122	126	102	95	94	110	135	129.94	151.38
CAIDI	170.6	241.7	175	166	163	169	179	158	130	137	123	122	111	127	127	129.42	139
Duke	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.36	1.22	1.21	1.27	1.32	1.23	1.26	1.3	1.32	1.27	1.29	1.17	1.16	1.03	1.1	0.99	1.06
SAIDI	134	127	124	138	136	133	146	133	138	146	149	138	140	121	142.49	138.3	156.2
CAIDI	98	103	102	109	103	109	116	102	104	115	115	118	121	117.5	129.6	139.6	148
IPL	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.03	0.79	0.71	0.9	1.07	0.76	1.04	0.94	1.04	0.86	0.82	0.58	0.71	0.66	0.74	0.86	0.949
SAIDI	73.8	65.7	53.2	66.5	105.15	46.99	80.84	81.13	71.15	75.08	56.71	48.33	56.71	48.7	61.64	59.64	67.459
CAIDI	72	83.2	74.5	73.9	98.01	61.7	77.68	86.23	68.13	87.63	69.57	82.78	80.24	73.7	82.85	69.05	71.084
Vectren	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.46	1.27	1.12	1.68	1.51	1.23	1.42	1.2	1.02	1.43	1.07	0.73	0.92	0.85	0.85	0.64	0.8
SAIDI	164	111	106.8	137	151	89	133	110	89.7	137	83	47.5	67.2	70.9	61.84	58.8	78.3
CAIDI	107	87	95.4	82	100	72	94	92	88.3	95.7	77.5	65.1	73	82.9	82.85	91.6	97.6
I&M	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SAIFI	1.12	0.95	1.25	1.00	1.12	1.11	1.12	0.83	0.74	0.99	0.91	0.74	0.77	1.05	0.95	0.98	1.10
SAIDI	179.10	128.50	194.10	170.70	146.70	139.10	143.70	90.30	111.30	153.70	136.70	113.70	127.50	160.10	152.90	166.30	175.70
CAIDI	159.30	135.00	155.60	171.10	130.60	125.60	128.60	108.80	150.90	156.10	151.10	154.00	165.40	152.60	160.80	170.21	159.70

Notes

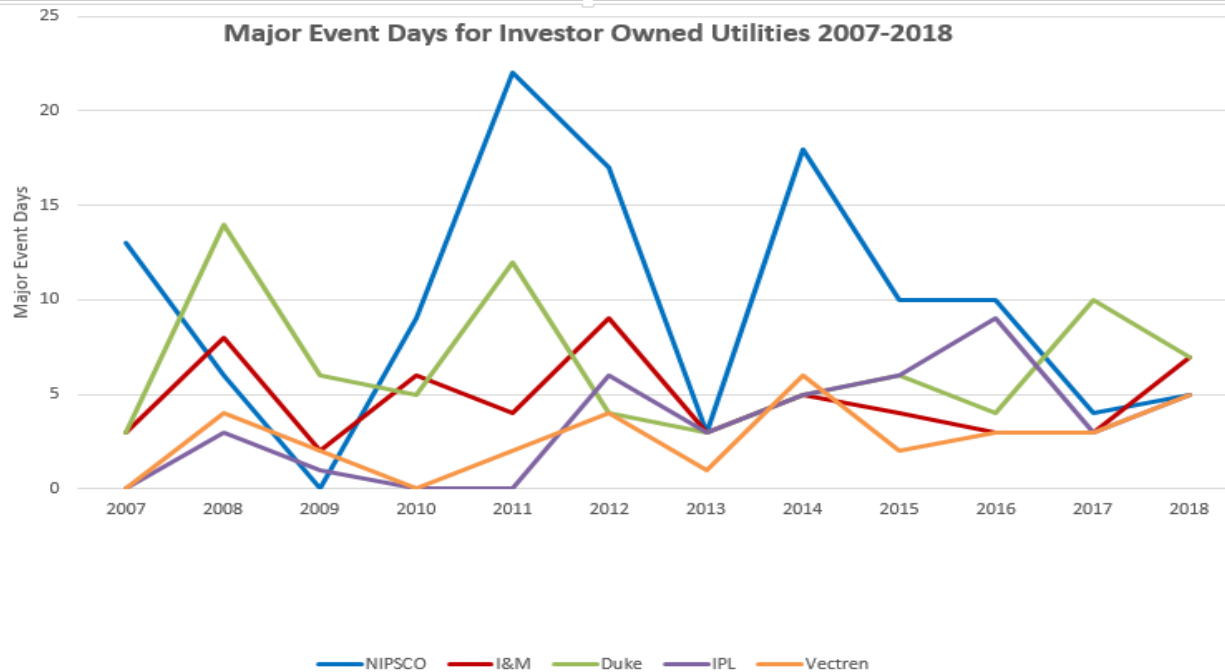
SAIFI: System Average Interruption Frequency Index; (# of customers who experience outage) / (total # of customers)

SAIDI: System Average Interruption Duration Index; (duration or time of service interruptions) / (total # of customers)

CAIDI: Customer Average Interruption Duration Index; (SAIDI) / (SAIFI)

MAJOR EVENT DAYS 2007-2018

Major Event Days for Investor Owned Utilities 2007-2016														2017	2018	Mean
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Mean			
NIPSCO	13	6	0	9	22	17	3	18	10	10	4	5	10			
Duke	3	14	6	5	12	4	3	5	6	4	10	7	7			
IPL	0	3	1	0	0	6	3	5	6	9	3	5	3			
Vectren	0	4	2	0	2	4	1	6	2	3	3	5	3			
I&M	3	8	2	6	4	9	3	5	4	3	3	7	5			



RELIABILITY REPORTS FOR EACH INDIANA INVESTOR-OWNED ELECTRIC UTILITY INCLUDING MAJOR EVENTS

*Electric Reliability Including Major Events

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NIPSCO																	
SAIFI	1.41	1.65	1.38	1.24	1.40	2.23	1.80	0.88	1.36	1.38	1.44	1.45	1.53	1.16	1.16	1.16	1.33
SAIDI	542.40	498.00	317.00	258.00	317.00	1073.00	882.00	140.00	505.00	371.00	428.00	520.00	603.00	248.00	248.00	248.00	244.26
CAIDI	384.70	301.80	229.00	208.00	227.00	480.00	490.00	158.00	372.00	269.00	297.00	359.00	395.00	214.00	214.00	214.00	184.00
Duke																	
SAIFI	1.57	1.58	1.66	1.59	1.63	1.41	2.48	1.76	1.58	2.07	1.52	1.38	1.31	1.27	1.34	1.33	1.45
SAIDI	170	201	255	282	203	178	689	293	195	630	216	257	186	211	289.79	260.7	366
CAIDI	109	128	153	177	125	126	278	166	124	304	143	187	142	166.1	216.69	196	252.9
IPL																	
SAIFI	1.17	0.9	0.81	0.9	1.07	0.76	1.54	1.1	1.04	0.86	1.04	0.71	0.96	0.94	1.17	0.95	1.13
SAIDI	132.9	98	76.7	66.5	105.15	46.99	358.98	158.39	71.15	75.08	124.92	92.3	189.98	219.45	232.23	80	149.03
CAIDI	113.3	108.4	94.1	73.9	98.01	61.7	232.96	144.63	68.13	87.63	119.66	130.01	198.63	233.12	198.48	84.6	131.42
Vectren																	
SAIFI	1.46	1.27	2.36	2.05	1.87	1.23	2.33	2.56	1.02	2.16	1.24	0.78	1.47	0.9	1.26	0.8	1.09
SAIDI	164	111	932.4	376	241	89	859	2889	89.7	711.3	117.3	60.1	314.3	81.3	260.9	85.6	140.4
CAIDI	107	87	394.7	185	128	72	369	1126	88.3	329.9	94.9	76.6	213.5	90.6	206.9	106.6	128.5
I&M																	
SAIFI	1.68	1.56	1.42	1.31	1.24	1.24	1.63	0.91	0.98	1.12	1.39	0.96	0.96	1.24	1.06	1.11	1.28
SAIDI	930.60	594.20	291.40	1131.60	222.00	199.40	1164.30	121.50	392.30	258.00	1071.20	374.50	305.90	390.30	255.00	257.90	262.80
CAIDI	553.50	380.20	204.70	863.00	178.70	161.20	712.80	133.20	399.80	230.30	772.50	392.00	317.80	313.90	240.60	233.30	206.00

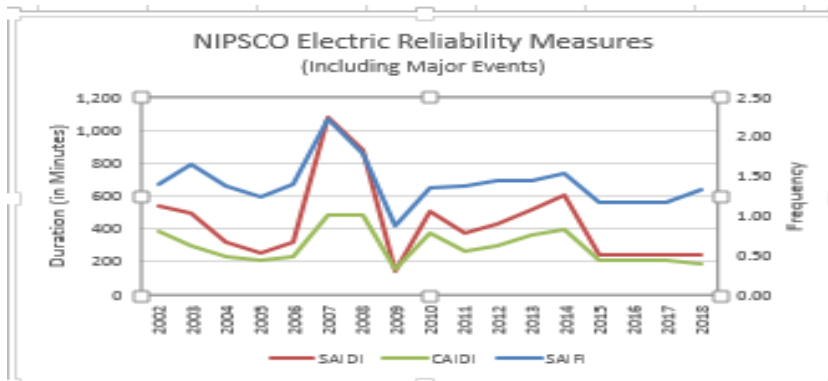
Notes

SAIFI: System Average Interruption Frequency Index; (# of customers who experience outage) / (total # of customers)

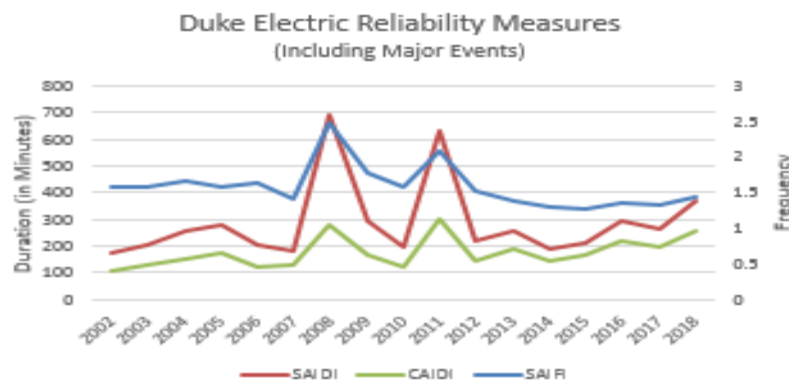
SAIDI: System Average Interruption Duration Index; (duration or time of service interruptions) / (total # of customers)

CAIDI: Customer Average Interruption Duration Index; (SAIDI) / (SAIFI)

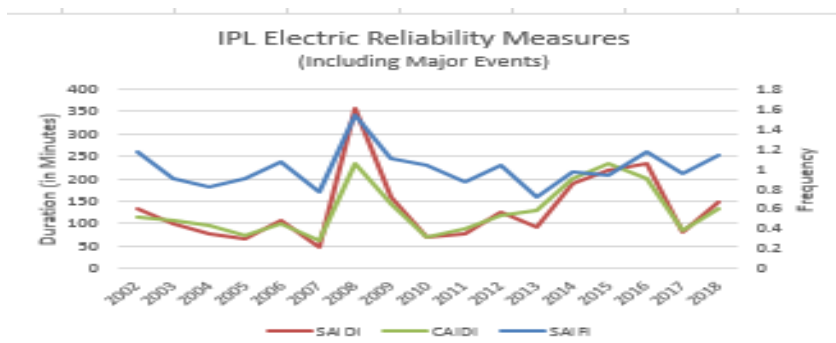
*Major events typically are storms and weather events that are more destructive than normal storm patterns. Other events, as described in the narrative, may also constitute major events. The same definition of "major event" is not used by all utilities.



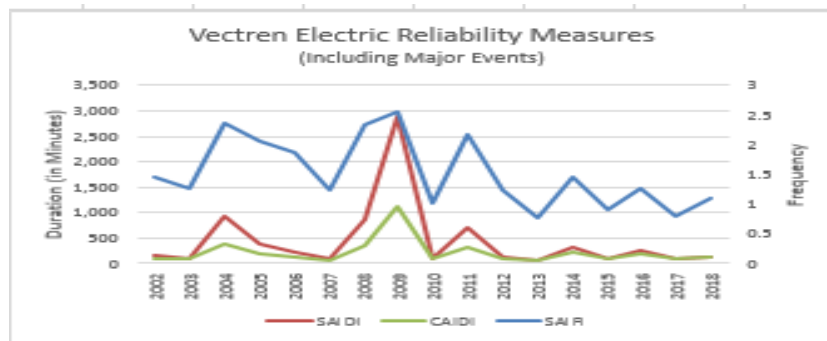
		Electric Reliability Including Major Events																
NIPSCO		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	SAIFI	141	165	138	124	140	2.23	1.80	0.88	1.36	1.38	1.44	1.45	1.53	1.16	1.16	1.16	1.33
	SAIDI	542	498	317	258	317	1,073	882	140	505	371	428	520	603	248	248	248	244
	CAIDI	385	302	229	208	227	480	490	158	372	269	297	359	395	214	214	214	184



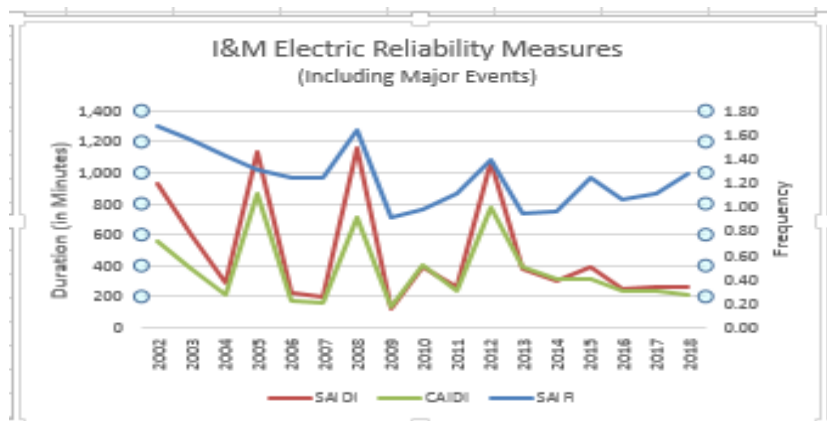
		Electric Reliability Including Major Events																
Duke		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	SAIFI	157	158	166	159	163	141	2.48	1.76	1.58	2.07	1.52	1.38	1.31	1.27	1.34	1.33	1.45
	SAIDI	170	201	255	282	203	178	689	293	195	630	216	257	186	211	290	261	366
	CAIDI	109	128	153	177	125	126	278	166	124	304	143	187	142	166	217	196	253



		Electric Reliability Including Major Events																
IPL		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	SAIFI	1.17	0.9	0.81	0.9	1.07	0.76	1.54	1.1	1.04	0.86	1.04	0.71	0.96	0.94	1.17	0.95	1.13
	SAIDI	133	98	77	67	105	47	359	158	71	75	125	92	190	219	232	80	149
	CAIDI	113	108	94	74	98	62	233	145	68	88	120	130	199	233	198	85	131



		Electric Reliability Including Major Events ⁱ																
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Vectren	SAIFI	1.46	1.27	2.36	2.05	1.87	1.23	2.33	2.56	1.02	2.16	1.24	0.78	1.47	0.9	1.26	0.8	1.09
	SAIDI	164	111	932	376	241	89	859	2,883	90	711	117	60	314	81	261	86	140
	CAIDI	107	87	395	185	128	72	369	1,126	88	330	95	77	214	91	207	107	129



		Electric Reliability Including Major Events																
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
I&M	SAIFI	1.68	1.56	1.42	1.31	1.24	1.24	1.63	0.91	0.98	1.12	1.39	0.96	0.96	1.24	1.06	1.11	1.28
	SAIDI	931	594	291	1,132	222	199	1,164	122	392	258	1,071	375	306	390	255	258	263
	CAIDI	554	380	205	863	179	161	713	133	400	230	773	392	318	314	241	233	206

It should be noted that Indiana's electric utilities have several metrics beyond those included in this Report. Over time and with technology changes such as Advanced Metering Infrastructure (AMI), Smart Grid, increased penetration of all forms of Distributed Energy Resources (DERs), greater numbers of electric vehicles, and changing customer needs, these metrics may undergo some revisions. It is also possible that new metrics may be developed to provide better reliability information.

ⁱ (e) Each investor-owned utility shall file a reliability indices report with the commission's electricity division on or before March 1 of each year. The first report filed under this section shall include data from the previous three (3) calendar years. Subsequent reports filed under this section shall include data only from the previous calendar year. The report shall contain the following information: (1) The reliability indices SAIDI, CAIDI, and SAIFI, with and without major events, for the utility's system and for each district or region into which its system may be divided. The utility shall report these data and analyses on a form prescribed by the commission. (2) The definition of major event used by the utility for reporting purposes. (3) For the reported indices, the number of customers used for the calculations and the utility's definition of customer... (f) The commission may require that data be reported by the utilities in order to determine whether a utility is providing service consistent with this rule. The utility shall maintain historical CAIDI, SAIDI, SAIFI, and supporting data needed to calculate those indexes for a minimum of seven (7) years. (Indiana Utility Regulatory Commission; No. 33629: Standards of Service For Electrical Utilities Rule 21; filed Mar 10, 1976, 9:10 a.m.; Rules and Regs. 1977, p. 355; readopted filed Jul 11, 2001, 4:30 p.m.; 24 IR 4233; filed Oct 18, 2004, 2:40 p.m.; 28 IR 789; readopted filed Apr 24, 2007, 8:21 a.m.; 20070509-IR-170070147RFA; adopted filed Aug 2, 2013, 2:16 p.m.; 20130828-IR-170130227RFA).